Small Business Innovation Research/Small Business Tech Transfer

Small Submersible Robust Microflow Cytometer for Quantitative Detection of Phytoplankton, Phase I

Completed Technology Project (2010 - 2010)

Project Introduction

Translume will develop an extremely robust, inexpensive micro flow cytometer (mFCM) for quantitative detection of phytoplankton. This device will be designed to be deployed on oceanographic platforms, such as moored buoys, or autonomous vehicles of the type presently used by our collaborator Dr. Needoba at the NSF Center for Coastal Margin Observation and Prediction. Our microflow cytomer will be optimized for low power consumption and autonomous long-endurance operations. Previous flow cytometers designed for at-sea applications are physically large and have considerable consumable needs. While the core of these instruments may be small, they require ancillary systems that drastically increase their size, weight, and power consumption. In order to reduce size and power consumption, our mFCM will operate without any pump. We will rely on sea motion (either waves or motion of the vehicle) to drive the fluid (sample and sheath) through our cytometer. The flow velocity will be unsteady and at times may be severely pulsed. This mode of operation would normally be considered unacceptable, as it would drastically affect the flow characteristics such as sheathing, as well as phytoplankton size and density measurements. However, our device will include an integrated optical flow velocity measurement capability that will remediate these shortcomings. The complexity associated with this velocity measurement capability, and the related power consumption, is only a small fraction of that of a pump-operated system. Thus the practical challenges of oceanic deployments will be significantly reduced. Expenditure of sheathing fluid will be minimized using advanced three-dimensional microfluidic design features; or potentially completely eliminated using a sheath-less design. Extreme robustness will be insured by creating all elements (microfluidic optics, structural frame) in a single fused silica monolith providing permanent and exact alignment of all elements.

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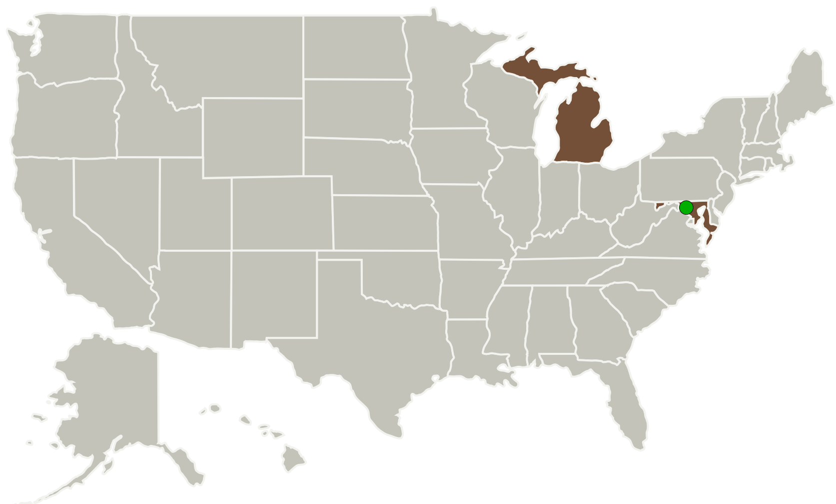
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Translume, Inc.	Lead Organization	Industry	Ann Arbor, Michigan
Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations	
Maryland	Michigan

Project Transitions

January 2010: Project Start

July 2010: Closed out

Closeout Summary: Small Submersible Robust Microflow Cytometer for Quanti tative Detection of Phytoplankton, Phase I Project Image

Closeout Documentation:
- Final Summary Chart Image*(https://techport.nasa.gov/file/140007)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Translume, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

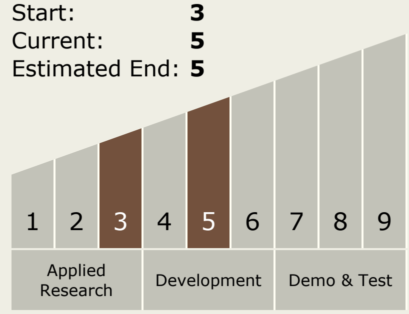
Carlos Torrez

Principal Investigator:

Thomas Haddock

Technology Maturity (TRL)

Start: **3**
Current: **5**
Estimated End: **5**



Technology Areas

Primary:

- TX08 Sensors and Instruments
  - └ TX08.3 In-Situ Instruments and Sensors
    - └ TX08.3.4 Environment Sensors

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System